

ABSTRACT OF THE INVENTION

A method is disclosed for designing two separable filters, **LPP** & **HPP**, that, when applied in sequence with a subtraction step, approximates the circularly symmetric frequency response achievable using a non-separable filter. The method of the present invention comprising: First, (a) selecting a cut-off
5 frequency and designing therefrom a 1-D low pass filter **LP** such that: $\mathbf{LP} = [X_{-n}, X_{-(n-1)}, \dots X_0, \dots X_{n-1}, X_n]$. Next, (b) obtaining a 2-D filter **LPP** by performing the operation: $\mathbf{LP}^* \times \mathbf{LP}$; wherein \mathbf{LP}^* is a column vector having the same entries as **LP** and **LPP** having dimensions given by: $\{2n+1, 2n+1\}$; and generating a 2-D contour plot therefor. Next, (c) designing a 1-D high pass filter **HP** such that:
10 $\mathbf{HP} = [Y_{-m}, Y_{-(m-1)}, \dots Y_0, \dots Y_{m-1}, Y_m]$. Next, (d) obtaining a 2-D filter **HPP** by performing the operation: $\mathbf{HP}^* \times \mathbf{HP}$; wherein \mathbf{HP}^* is a column vector having the same entries as **HP** and **HPP** having dimensions: $\{2m+1, 2m+1\}$ and obtaining a 2-D contour plot therefor. Next, (e) repeating (c) through (d) until the 2-D contour plot of **HPP** overlaps the 2-D contour plot of **LPP**. Next, (f) generating a 2-D
15 filter **ONE** having the dimensions of that of **HPP** with the only non-zero entry of value 1 located at the center of **ONE**. Next, (g) creating matrix **HPPinv** by subtracting **HPP** from **ONE**. Next, (h) convolving **LPP** with **HPPinv** to obtain **DSCRN** having dimensions: $\{2m+2n+1, 2m+2n+1\}$; and obtaining a 2-D contour plot therefor. Next, (i) repeating (a) through (h) until, by an examination of the 2-
20 D contour plot of **DSCRN**, an approximation to a desired circular symmetry is achieved.